LADDER DIAGRAM MONITORING DEVICE CAPABLE OF ADDITIONALLY DISPLAYING OPERATION SITUATION OF CNC IN COMMENT

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a ladder diagram monitoring device, and in particular, relates to a ladder diagram monitoring device on which an operation situation of a ladder program and an operation situation of a CNC can be simultaneously checked.

[0003] 2. Description of the Related Art

[0004] FIG. **7** shows a display example of a ladder program including circuit comments.

[0005] In general, when a ladder program executable by a programmable controller is debugged and diagnosed, icons of contacts and coils are displayed on a ladder diagram monitor display screen and display modes of the icons are changed (in FIG. **7**, the contacts and the coils whose signal states are ON are presented as enclosed by dotted frames) to thereby display the signal states of a ladder circuit, and annotations of the ladder circuit as circuit comments.

[0006] As a prior art for checking operation of the ladder program, there is known a technique in which states of signals used in a ladder program, related signals designated, and parameter values of functional commands are simultaneously displayed with a ladder diagram monitor display function, for example, in Japanese Patent Laid-Open No. 08-123515. Using the technique, debugging of the ladder program of the programmable controller can be facilitated.

[0007] Moreover, there are also known techniques in which in a ladder program constituted of a plurality of ladder circuits, a comment explaining the processing content of a specific ladder circuit among those circuits (circuit comment) is displayed in the vicinity of the ladder circuit, in Japanese Patent Laid-Open No. 05-250014 and Japanese Patent Laid-Open No. 2011-107810. These techniques help a user in understanding the ladder circuits.

[0008] In a CNC (numerical controller) including a programmable controller built therein, the CNC and the ladder program cooperate with each other to perform control operations; for example, the ladder program is used to control a numerically controlled axis, or the ladder program controls an external device based on an instruction from an NC program. When such a ladder program which cooperatively works with the CNC is debugged and diagnosed, it is also often required to check related operation situations of the CNC in addition to states of signals and values of parameters which are used in the ladder circuit.

[0009] Nevertheless, since a screen on which the operation situations of the CNC can be checked is typically a different screen from a screen for the ladder diagram monitor display function, the screens need to be switched individually to view the information for checking the information on both screens. In this case, the information on both screens cannot be simultaneously checked, and there can also be a case where the debugging and the diagnosis are difficult.

[0010] There is in sometime cases provided a function of displaying information on the operation situations of the CNC in addition to the ladder diagram monitor display. However, since information of the CNC needed in debugging and diagnosing is different depending on the ladder circuit, the information of the CNC to be displayed has to be reselected individually for the particular ladder circuit to be debugged and diagnosed.

SUMMARY OF THE INVENTION

[0011] An object of the present invention is to provide a ladder diagram monitoring device on which an operation situation of a ladder program and an operation situation of a CNC can be simultaneously checked.

[0012] There is provided a ladder diagram monitoring device according to the present invention which displays, on a monitor, an operation situation of a ladder program which is capable of describing comment information added to a circuit executed on a programmable controller built in a CNC. A portion of a character string which is described in a specific format and is included in a circuit comment added into the ladder program is replaced by information on an operation situation and the like of the CNC at that time point (an NC program in execution, a coordinate value and the like) to be displayed. Thereby, the states of signals used in the ladder program and the relevant information of the CNC can be simultaneously viewed. Thus, the operation situation of the ladder program can be efficiently diagnosed.

[0013] In the ladder diagram monitoring device according to the present invention, the operation situation of the ladder program is displayed on a monitor, the comment information added to the circuit executed on the programmable controller built in the numerical controller can be described in the ladder program, and the comment information added to the circuit is provided with a region for displaying the information on the operation situation of the numerical controller. Further, the ladder diagram monitoring device includes a ladder program operation situation acquisition unit that acquires information on the operation situation of the ladder program, a CNC operation situation acquisition unit that acquires information on the operation situation of the numerical controller, a display data generation unit that generates display data, which reflects the operation situation of the ladder program and is for displaying the operation situation of the numerical controller in the region in the comment information added to the circuit, based on the ladder program, the information on the operation situation of the ladder program, and the information on the operation situation of the numerical controller, and a display unit that displays the display data.

[0014] The region in the comment information added to the circuit may present a keyword corresponding to the information on the operation situation of the numerical controller, and the display data generation unit may be configured to generate the display data by replacing the keyword in the comment information added to the circuit by the information on the operation situation of the numerical controller corresponding to the keyword.

[0015] The ladder diagram monitoring device may further include a CNC information list table in which the keyword corresponding to the information on the operation situation of the numerical controller, included in the comment information added to the circuit of the ladder program, is registered, and the CNC operation situation acquisition unit may be configured to acquire the information on the operation situation of the numerical controller corresponding to the keyword registered in the CNC information list table from the numerical controller.